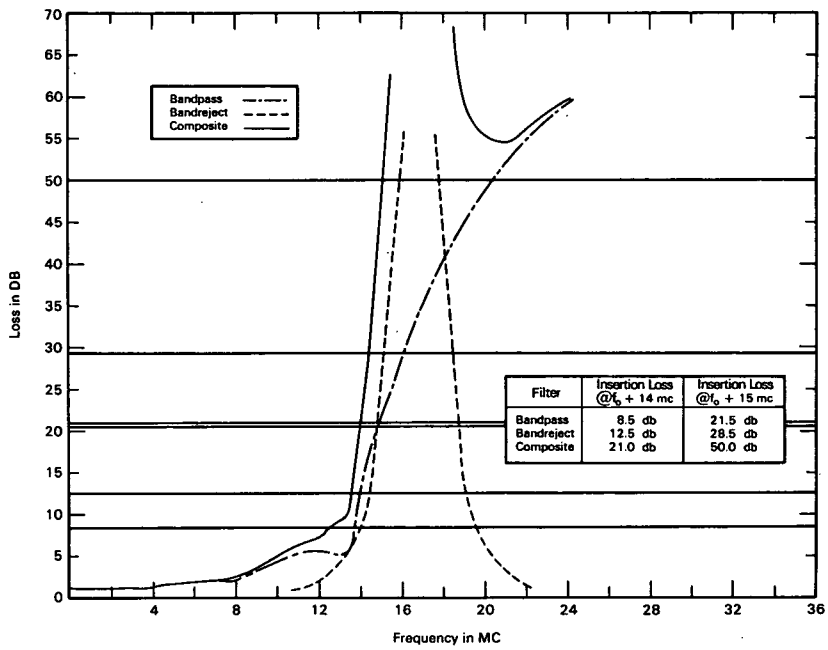
NASA TECH BRIEF

Composite Filter Steepens Rejection Slopes in Microwave Application



Filter	Insertion Loss @f_o + 14 mc	Insertion Loss @f_o + 15 mc
Bandpass	8.5 db	21.5 db
Bandreject	12.5 db	28.5 db
Composite	21.0 db	50.0 db

The problem:

To obtain sharp rejection slopes in microwave transmission by filtering techniques. Common monotonic rejecting filters, when used to yield bandpass or bandreject responses, contain complex arrangements of circuit elements which cannot be readily realized as a microwave structure.

The solution:

A composite filter consisting of a bandpass filter to shape the passband and a bandreject filter on each edge of the bandpass filter to steepen the rejection slopes.

How it's done:

High unloaded Q-filters are used in order to prevent interaction between the bandpass and bandreject filters that could result in spurious transmissions. As the table and graph show, the bandpass filter (tuned at f_0) exhibits certain insertion losses at f_0+14 mc and at f_0+15 mc. The bandreject filter (tuned at $f_0+16.75$ mc) exhibits sharper insertion losses at f_0+14 mc and f_0+15 mc, while the composite filter insertion loss is seen to be the algebraic sum of the bandpass and bandreject losses.

Notes:

1. A typical Butterworth design would require 40 resonant cavities with unloaded Q's of 47,000, unattainable in standard waveguide designs. The composite design would contain only 27 cavities with unloaded Q values in the order of 8,000.

(continued overleaf)

2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
Goddard Space Flight Center
Greenbelt, Maryland 20771
Reference: B66-10393

Patent status:

No patent action is contemplated by NASA.

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